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On the equation $\det Du = f$ with no sign assumptions

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Abstract: Given a bounded smooth domain, is it possible to find a vector valued function u such that its Jacobian determinant is equal to a given function f of class C^k and, u is the identity on the boundary of the domain? A suitable compatibility condition on f has to be assumed, otherwise there is no hope of solving the problem. When f is positive a complete answer (existence and regularity) has been given in a celebrated paper by B.Dacorogna and J.Moser (1990). The solvability of the problem when f changes sign, or f is non-negative, has been an open problem for a long time. In a joint paper with B.Dacorogna and O.Kneuss we prove that the problem is solvable also in these cases. I will discuss this result and its main features.